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Takanori Itou

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FOLEY AND LARDNER LLP  
SUITE 500  
3000 K STREET NW  
WASHINGTON, DC 20007

EXAMINER

LEONG, JONATHAN G

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/581,858  
Filing Date: June 30, 2006  
Appellant(s): ITOU ET AL.

\_\_\_\_\_  
Michael D. Kaminski (#32904)  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 8/9/2011 appealing from the Office action mailed 10/27/2010.

**(1) Real Party in Interest**

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The following is a list of claims that are rejected and pending in the application:

Claims 1-3 and 6.

**(4) Status of Amendments After Final**

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

**(5) Summary of Claimed Subject Matter**

The examiner has no comment on the summary of claimed subject matter contained in the brief.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

The examiner notes that due to entry of the After Final Amendment filed 1/26/2011, the rejection of the claims has been adjusted to account for the cancelation of dependent claims 11 and 12 and the amending of claim 1, which does NOT constitute a new grounds of rejection.

**(7) Claims Appendix**

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

**(8) Evidence Relied Upon**

US 6071649	Mao et al.	6-2000
US 2003/0157409	Huang	8-2003
JP H07-245105	Nagayama	9-1995

Machine Translation of JP H07-245105 originally published 9-1995 to Nagayama

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

**Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mao et al. (US 6071649) in view of Huang (US 2003/0157409), as evidenced by Nagayama (JP H07-245105, see Machine Translation).**

*Examiner's Note: This Ground of Rejection was modified only in response to the entry of the after final amendment filed 1/26/2011 which canceled claims 11 and 12.*

Regarding claims 1 and 6 (*Examiner's Note: This Rejection Preamble was modified only in response to the entry of the after final amendment filed 1/26/2011 which canceled claims 11 and 12.*), Mao discloses a non-aqueous electrolyte lithium ion battery (C1/L12-15), comprising: a positive electrode active material layer (C2/L19-20) comprising: an oxide containing lithium and nickel (C2/L50-55); and a lithium compound deposited on a surface of the oxide, the lithium compound covering nickel present on the surface of the oxide (C2/L55-59), the lithium compound comprising  $\text{LiCoO}_2$  (C2/L59); a negative electrode active material layer comprising a negative electrode active material (C2/L25-31); and an electrolyte layer disposed between the positive and negative electrode active material layers (C2/L38-46).

While Mao does not explicitly disclose the lithium compound is one selected from the group listed in instant claim 1, it is well-known in the art that  $\text{LiCoO}_2$  (C2/L59) and

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lithium sulfate are common choices as lithium compounds for use with positive active materials as evidenced by Huang (Claim 5). Thus, it would have been obvious to one having ordinary skill in the art at the time of the invention to use lithium sulfate instead of  $\text{LiCoO}_2$  to cover the oxide containing lithium and nickel as disclosed by Mao since one having ordinary skill in the art at the time of the invention would have had reasonable expectation of success in doing so as evidenced by Huang (Claim 5). Additionally, as long as the lithium compound covers the oxide containing lithium and nickel, one having ordinary skill in the art at the time of the invention would have reasonably expected a success of inhibition of decomposition of the electrolyte solution since the contact surface of the oxide containing lithium and nickel is decreased (as evidenced by Nagayama [0022]).

While modified Mao does not explicitly disclose that the lithium compound prevents oxygen radicals being released from the surface of the oxide from decomposing an electrolysis solution; and gas generation by the decomposition of the electrolysis solution is suppressed, it is noted that once an oxide containing lithium and nickel is disclosed to have a lithium compound (e.g. lithium sulfate) deposited on a surface of the oxide containing lithium and nickel (see Mao: C2), and therefore is substantially the same as the positive electrode material as claimed, it will, inherently, display the recited functional properties (MPEP 2112).

Regarding claims 2 and 3, modified Mao discloses all of the claim limitations as set forth above. Mao further discloses that as the amount of coating increases, the

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charge efficiencies increased but the initial capacities decreased (C4/L45-47). While modified Mao does not explicitly disclose the lithium compound is deposited to cover substantially an entire surface of the oxide, thickness of a cover layer of the lithium compound ranges from 5nm to 1µm; the lithium compound is deposited to sprinkle on the surface of the oxide, a volume of the lithium compound ranges from 0.5 to 10% with respect to that of the positive electrode active material, the relative amount of surface coverage, thickness of a cover layer, and volume % of the lithium compound all relate to a general relative amount of lithium compound. Thus, the amount of the lithium compound would have been considered a result effective variable by one having ordinary skill in the art at the time of the invention as evidenced by Mao (C4/L45-47). As such, without showing unexpected results, the claimed surface coverage, thickness of cover layer, and volume % of the lithium compound cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the surface coverage, thickness of cover layer, and volume % of the lithium compound in the positive electrode material of modified Mao to obtain the desired balance between the charge efficiencies and the initial capacities (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223) (MPEP 2144.05).

**(10) Response to Argument**

2. Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mao et al. (US 6071649) in view of Huang (US 2003/0157409), as evidenced by Nagayama (JP H07-245105, see Machine Translation).

Appellants have argued, with regard to claim 1, that neither Mao, Huang, nor Nagayama, alone or in combination, discloses, teaches or suggests “a lithium compound deposited on the surface of the oxide, wherein the lithium compound is lithium sulfate” by stating: (a) Mao discloses coating the  $\text{LiNiO}_2$  particles with a lithiated transition metal oxide material that is specifically lithium cobalt oxide or cobalt-doped lithium nickel oxide; (b) Huang does not teach that the slurry might include an oxide containing lithium and nickel, and lithium sulfate deposited on a surface of the oxide.

The Examiner respectfully submits that Mao's disclosure that the lithium compound deposited is lithium cobalt oxide or cobalt-doped lithium nickel oxide (C2/L55-59) was simply a preferred embodiment and that Mao is not limited to cobalt containing lithium oxides as the lithium compound deposited on a surface of the  $\text{LiNiO}_2$ . In fact, Mao discloses that a known problem with using  $\text{LiNiO}_2$  as positive active material is that during charge/discharge cycling, an inactive layer can develop on the surface of  $\text{LiNiO}_2$  particles, causing an increase in surface resistance and a decrease in the capacity of the material (C3/L1-4). In order to solve this problem, Mao discloses



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that as long as the surfaces of the  $\text{LiNiO}_2$  particles are modified by coating with another material, the particles become less moisture sensitive and more stable with respect to capacity (C3/L4-7). This problem with  $\text{LiNiO}_2$  and the known benefit with respect to the coating of  $\text{LiNiO}_2$  positive active materials is also evidenced by Nagayama who teaches that when  $\text{LiNiO}_2$  positive active material particles are coated, the decrease in contact between  $\text{LiNiO}_2$  and the nonaqueous electrolyte provides improved performance since the formation of an inactive film on the surface of the  $\text{LiNiO}_2$  particles is inhibited (Nagayama: [0022]). Thus, both Mao and Nagayama show that coating  $\text{LiNiO}_2$  particles with other positive active materials solves the known problem and improves the performance of the battery. Since Mao discloses that as long as  $\text{LiNiO}_2$  particles are not directly in contact with the electrolyte, i.e., the  $\text{LiNiO}_2$  particles are coated with another material, the performance benefits are obtained (Mao: C3/L1-7), one having ordinary skill in the art at the time of the invention would have found it obvious to coat  $\text{LiNiO}_2$  particles with any known positive active material so to obtain said performance benefits. Huang was not relied upon to teach coating  $\text{LiNiO}_2$ , instead as discussed above, Mao and Nagayama disclosed the coating of  $\text{LiNiO}_2$ . Huang was relied upon to teach commonly known positive electrode active materials and provide a finite number of solutions of commonly known choices for positive electrode active materials which includes  $\text{LiCoO}_2$ , lithium carbonate ( $\text{Li}_2\text{CO}_3$ ), and lithium sulfate ( $\text{Li}_2\text{SO}_4$ ) (Huang: Claim 5). As described above, both Mao and Nagayama recognized the problem with using  $\text{LiNiO}_2$  as positive active material wherein an inactive layer can develop on the surface of  $\text{LiNiO}_2$  particles, causing an increase in surface resistance and a decrease in the

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capacity of the material (Mao: C3/L1-4; Nagayama [0022]). Since Mao further recognized that as long as  $\text{LiNiO}_2$  particles are not directly in contact with the electrolyte, i.e., the  $\text{LiNiO}_2$  particles are coated with another material, the performance benefits are obtained (Mao: C3/L1-7), the ordinary artisan would have had a reasonable expectation of success in coating  $\text{LiNiO}_2$  particles with  $\text{Li}_2\text{SO}_4$  since it was a known positive active material as taught by Huang (claim 5) and said coating would provide for the  $\text{LiNiO}_2$  particles to not be in direct contact with the electrolyte.

Appellants further argue that the rejection of claim 1 was improper because the prior art provides no motivation to combine Mao, Huang, and Nagayama, and that no proof to establish a *prima facie* case of obviousness under KSR rationale E was provided.

The Examiner respectfully submits that as described above, both Mao and Nagayama recognized the problem with using  $\text{LiNiO}_2$  as positive active material wherein an inactive layer can develop on the surface of  $\text{LiNiO}_2$  particles, causing an increase in surface resistance and a decrease in the capacity of the material (Mao: C3/L1-4; Nagayama [0022]), thus fulfilling the requirement that the cited references must recognize a problem or need in the art.

The Examiner respectfully further submits that since Mao discloses that as long as  $\text{LiNiO}_2$  particles are not directly in contact with the electrolyte, i.e., the  $\text{LiNiO}_2$  particles are coated with another material, the performance benefits are obtained (Mao: C3/L1-7), one having ordinary skill in the art at the time of the invention would have

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found it obvious to coat  $\text{LiNiO}_2$  particles with any known positive active material (examples being  $\text{LiCoO}_2$  as described by Mao,  $\text{Li}_2\text{CO}_3$  as described by Nagayama) so to obtain said performance benefits. Huang was relied upon to teach commonly known positive electrode active materials and provide a finite number of solutions of commonly known choices for positive electrode active materials which includes  $\text{LiCoO}_2$ , lithium carbonate ( $\text{Li}_2\text{CO}_3$ ), and lithium sulfate ( $\text{Li}_2\text{SO}_4$ ) (Huang: Claim 5), Thus fulfilling the requirement of providing a finite number of solutions to the recognized problem.

The Examiner respectfully further submits that since both Mao and Nagayama show that coating  $\text{LiNiO}_2$  particles with other positive active materials solves the known problem and improves the performance of the battery and since Mao discloses that as long as  $\text{LiNiO}_2$  particles are not directly in contact with the electrolyte, i.e., the  $\text{LiNiO}_2$  particles are coated with another material, the performance benefits are obtained (Mao: C3/L1-7), the ordinary artisan would have had a reasonable expectation of success in coating  $\text{LiNiO}_2$  particles with  $\text{Li}_2\text{SO}_4$  since it was a known positive active material as taught by Huang (claim 5) and said coating would provide for the  $\text{LiNiO}_2$  particles to not be in direct contact with the electrolyte.

Appellants further argue that the Examiner made a clear error by summarily dismissing the Applicant's evidence of unexpected results provided in the Declaration of Takamitsu Saito, filed 1/26/2011.

The Examiner respectfully disagrees and submits that the evidence of unexpected results is deficient at least since it is not reasonably commensurate in

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scope with the prior art reference Mao et al. (US 6071649) in view of Huang (US 2003/0157490) as evidenced by Nagayama (JP H07-245105). This is because the evidence has a coating of Lithium carbonate while Mao discloses a coating of lithium cobaltate. Thus, the Examiner cannot determine if there are unexpected results from substituting lithium sulfate with lithium cobaltate ( $\text{LiCoO}_2$ ). Further, it is unclear to the Examiner if the showing of evidence is repeatable as there are no error bars or standard deviation notation. The showing of evidence appears to have 3 curves while the evidence within the argument filed 1/26/2011 appears to have 4 curves. Only two of the curves are labeled, it is unclear to the Examiner what the other two curves represent. The Examiner notes that the original instant specification at page 7 line 14-30 seems to allow for lithium cobaltate, lithium carbonate, lithium sulfate and many others in order to obtain preferred results without singling out specific lithium compounds. The Examiner further submits that the details of the experiments are missing from the showing of evidence. For example, the evidence does not make clear if the amount of deposited lithium compound is the same between lithium carbonate and lithium sulfate, that is, it is unclear if the lithium carbonate was deposited in a thinner coating than the lithium sulfate (or vice-versa or some other difference in deposition such as incomplete surface coverage). The original instant specification at P9/L22-P10/L26 appears to disclose the importance of the amount of lithium compound deposited whereby too little lithium compound deposited leads to insufficient prevention of decomposition of the electrolysis solution while too much lithium compound deposited leads to increased resistance. Since the showing of evidence is unclear as to such deposition detail, the Examiner

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cannot determine if the comparison between Li carbonate and Li sulfate was done with substantially the same amounts of deposition of each Li compound which is a variable (among others) that could affect relative performance. In other words, without such experimental data and details, it is not clear whether the results from the graph of the showing of evidence is strictly due to the use of lithium sulfate or due to unfixed variables in the experiment (i.e. amount of deposition of the coating layer). Thus, it appears the showing of evidence is not commensurate in scope of the claims since the showing of evidence appears to show beneficial performance of Li sulfate, such performance would have required a specific range of deposition as discussed above (Instant Spec.: P9/L22-P10/L26), but the claim is absent of such a range of deposition. That is, the Applicant is claiming (in claim 1) that any amount of lithium sulfate deposition is sufficient to obtain the unexpected results. The evidence in light of the original instant specification does not appear to support such a claim.

#### **(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

/J. G. L./

Jonathan G. Leong

Examiner, Art Unit 1725

/Basia Ridley/

Supervisory Patent Examiner, Art Unit 1725

Conferees:

/B. R./

Supervisory Patent Examiner, Art Unit 1725

/William Krynski/

Quality Assurance Specialist, TC 1700